



PROPULSION AND PROPELLERS—BUILD A SIMPLE PROPELLER

Students will have a basic understanding of how a propeller works. (One in a series.)

LESSON PLAN

Lesson Objective

The students will:

- Be introduced to the engineering process as build, evaluate and modify a simple propeller flying toy.
- Learn to collect and analyze data as they modify the design.
- Understand propulsion using propellers.

Goal

In this lesson, each student will build and test a simple propeller. Then working in teams will gain a basic understanding of the engineering process and propeller driven propulsion.

After building the propeller flying toy by following the directions and illustrations on the student instruction sheet, students will work in groups to practice their flying technique and then collect data about estimated height of flight and graph the results. This flying toy was designed by Neil Francis.

See tips for flying on the Student Instruction Sheet. There is a PowerPoint presentation based on the instruction sheet.

Resources:

<http://www.eie.org/>

Francis, Neil. Super Flyers. Reading, MA: Addison-Wesley, 1988.

Grade Level: Grades 3-5

Next Generation Science Standards:

Science and Engineering Practices:

- Asking Questions and Defining Problems
- Developing and Using Models
- Planning and Carrying Out Investigations
- Analyzing and Interpreting Data
- Using Mathematics and Computational Thinking
- Constructing Explanations and Designing Solutions

Engineering Design:

- Defining and Delimiting Engineering Problems
- Developing Possible Solutions
- Optimizing the Design Solution

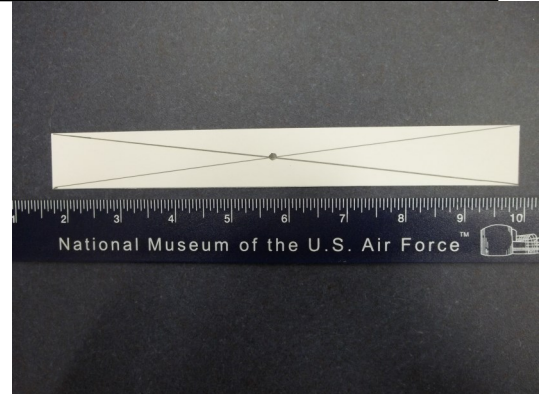
Materials Required:

- Cardboard or heavy card stock
- Drinking straws
- Tape
- Hole Punch
- Scissors
- Caution tape, string or some method to create a “fly zone”
- Safety glasses/Eye Protection
- Measuring Tape or yardstick —secure vertically on a wall in the designated fly zone
- Pencil or Pen
- Graph Paper if desired

Build a hand-launched Propeller Flying Toy Instruction Sheet

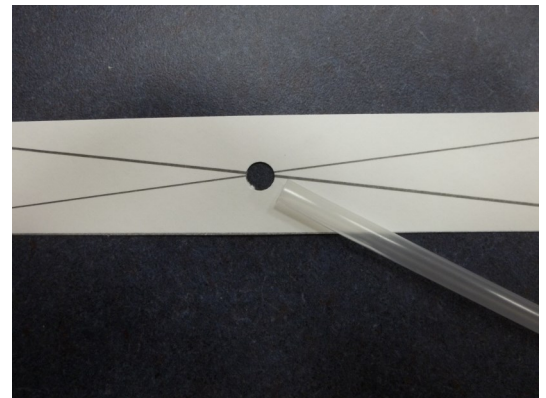
Step 1

Cut a piece of cardboard or heavy card stock (1 inch x 8 1/4 inches). This will be the propeller blade. Draw a line from the opposite corners to make an “x”. This will be the center point. Mark it with a dot.



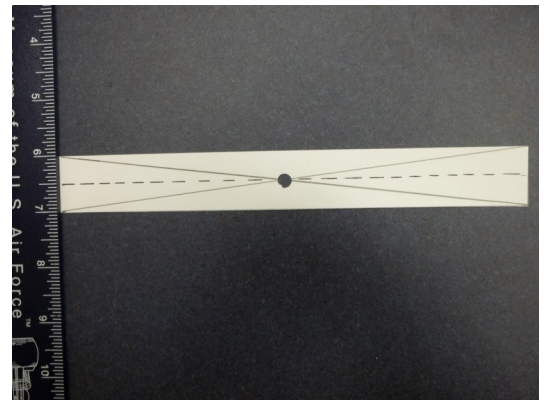
Step 2

At the dot, use a hole punch and make a hole that is slightly bigger than the diameter of the straw.



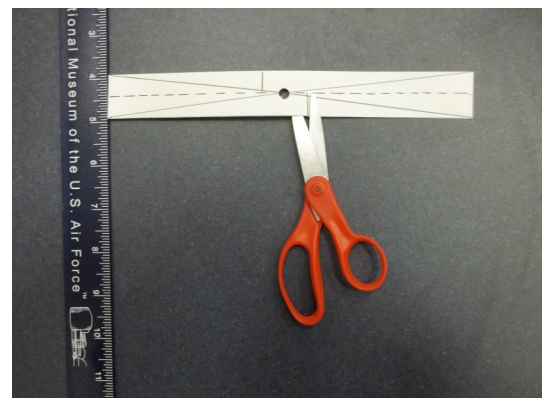
Step 3

Place the propeller blade long ways and measure 1/2 inch up from the bottom and mark a dotted line along the length. (This should be the center line of the rectangle).



Step 4

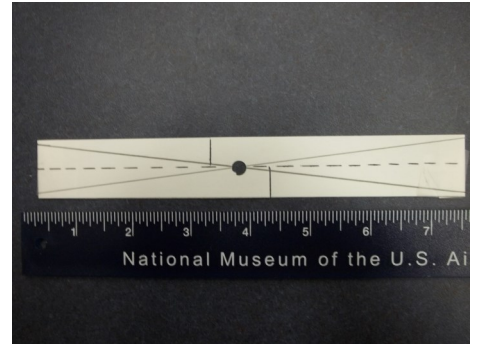
Measure 1/2 inch from either side of the hole. On the left side, mark from the top down to the dotted center line. On the right side, mark from the bottom up to the dotted center line. Now make a cut up to the center line at these two marks as shown.



Build a hand-launched Propeller Flying Toy Instruction Sheet

Step 5

Measure 1/2 inch from each tip of the blade and fold the tips under. Tape these folds down. This will add extra weight to the blade tips and increase the momentum as the blade spins.

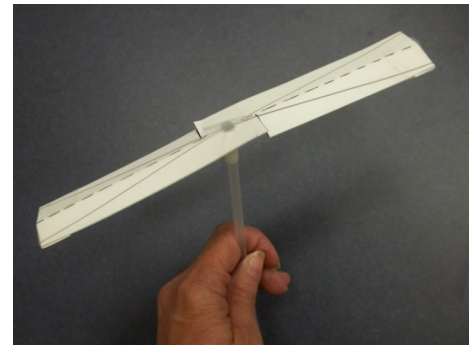
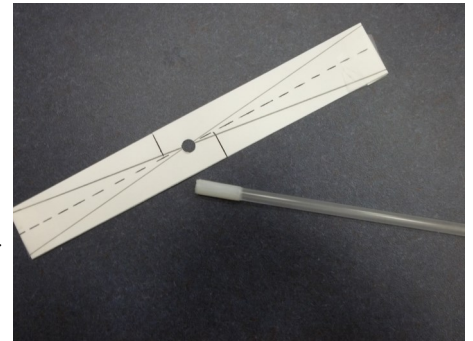


Step 6

From the small cuts outward, gently bend the blades down slightly along the fold line. Do not bend down too far. This should be a gently curve. Make sure both ends are bent down the same amount.

Step 7

To attach the straw, wrap tape around one end, so the wrapped end fits tightly when inserted into the hole of the propeller blade. If the propeller blade wobbles, tape the straw to the blade to hold it in place.



Step 8

Ready to Fly! Wearing eye protection, hold the straw between your palms. (Blade on top.) Roll your palms together so the propeller blade rotates rapidly counterclockwise. Now let go! The propeller will spin out of your hand and go up!

Flying Tips!

If the blade spins but won't climb, try bending the edges down more. If it climbs rapidly but stops spinning almost immediately, try reducing the amount of bend at the blade edge. Experiment to find the settings that work best for you. You may need to add a paper clip to the bottom of the straw for stability. Sometimes "pilots" release it too soon. Also, keep your thumbs out of the way while releasing it. Keep practicing!

BUILD A SIMPLE PROPELLER

TEAM WORKSHEET

Name _____

Student 1	Trial 1	Trial 2	Trial 3	Average
Estimated Height				

Student 2	Trial 1	Trial 2	Trial 3	Average
Estimated Height				

Student 3	Trial 1	Trial 2	Trial 3	Average
Estimated Height				

Student 4	Trial 1	Trial 2	Trial 3	Average
Estimated Height				

Student 5	Trial 1	Trial 2	Trial 3	Average
Estimated Height				

Student 1 Average	Student 2 Average	Student 3 Average	Student 4 Average	Student 5 Average	TEAM AVERAGE